CLAIMS

What is claimed is:

1. A voltage controlled oscillator (VCO), comprising:

a ring oscillator for producing an oscillation based on a low frequency bias signal and a high frequency bias signal;

a low frequency calibration circuit coupled to produce the low frequency bias signal based on a control voltage;

a low pass filter coupled to filter noise received by and produced within the low frequency calibration circuit; and

a high frequency VCO transconductance stage operably coupled to generate the high frequency bias signal based on the control voltage.

2. The VCO of claim 1 wherein the ring oscillator is coupled to receive the low frequency bias signal and the high frequency bias signal and further wherein the ring oscillator produces an oscillation having an output frequency corresponding to a sum of the low and high frequency bias signals.

3. The VCO of claim 2 wherein the low frequency bias signal has a magnitude that is at least twice as large as a magnitude of the high frequency bias signal.

4. The VCO of claim 1 wherein the low frequency calibration circuit further includes a current mirror having a plurality of stages that equals the number of delay elements within the ring oscillator, the current mirror for producing a steady state bias signal to each delay element of the ring oscillator.

5. The VCO of claim 4 wherein the low frequency calibration circuit further includes a low frequency transconductance stage for generating current having a current level that is

responsive to the control voltage, which current level defines a bias current through each stage of the current mirror of the low frequency calibration circuit.

6. The VCO of claim 5 wherein the low pass filter is coupled between gates of a reference device and each of the mirror devices of the current mirror.

7. The VCO of claim 1 wherein the high frequency VCO transconductance stage further includes a differential transconductance stage further including a plurality of multi-stage current mirror stages, wherein a magnitude and a polarity of the control voltage results in a corresponding amount of current being sourced or sinked from the low frequency bias signal.

8. The VCO of claim 7 wherein the low frequency calibration circuit and the high frequency VCO transconductance stage both adjust a magnitude of the bias signal.

9. A method for producing an oscillation, comprising:

receiving a control voltage;

producing a steady state bias signal based on the control voltage;

producing a transient bias signal responsive to the control voltage;

summing the steady state bias signal and the transientlow frequency bias signal to produce a frequency adjusted bias signal;

producing the oscillation based on the frequency adjusted bias signal.

10. The method of claim 9 further including filtering the steady state bias signal.

11. The method of claim 9 wherein the steps of producing transient bias signal and of summing the transient bias signal and the steady state bias signal includes sourcing additional current to be added to the steady state bias signal.

12. The method of claim 9 wherein the steps of producing the transient bias signal and of summing the transient bias signal and the steady state bias signal includes sinking current from the steady state bias signal.

13. The method of claim 9 further producing a steady state bias signal that is at least several times larger in magnitude than the transient bias signal.

14. The method of claim 9 wherein the transient bias signal is produced by a differential transconductance stage coupled to a pair of current mirrors wherein an output signal from the pair of current mirrors is coupled to a node conducting the steady state bias signal to source or sink current therefrom responsive to changes in the control voltage.

15. A voltage controlled oscillator (VCO), comprising:

a ring oscillator for producing an oscillation;

a first biasing circuit for producing a first bias signal to the ring oscillator, which first bias signal is a steady state bias signal;

a second biasing circuit for producing a second bias signal to the ring oscillator, which second bias signal is an adjustment bias signal to the first bias signal; and

wherein the ring oscillator is coupled to receive the first and second bias signal and further wherein the ring oscillator produces the oscillation having a frequency based on the first and second bias signals.

16. The VCO of claim 15 wherein the first biasing circuit further includes a low pass filter for filtering received noise and noise generated within the first biasing circuit.

17. The VCO of claim 16 wherein the low pass filter includes a corner frequency that is approximately one kilohertz.

18. The VCO of claim 16 wherein the first bias signal comprises a DC current.

19. The VCO of claim 16 wherein the first bias signal is a low frequency signal whose magnitude is a function of a received control voltage.

20. The VCO of claim 16 wherein the second bias signal is a high frequency bias signal whose magnitude is a function of a received control voltage.

21. The VCO claim 16 wherein the first bias signal has a magnitude that is at least twice as large as the second bias signal.

22. The VCO of claim 16 wherein the first bias signal has a magnitude that is at least five times as large as the second bias signal.

23. A phase locked loop (PLL), comprising:

a phase frequency detector;

a loop filter;

a charge pump coupled to receive control signals from the phase frequency detector and coupled to sink and source current from and to the loop filter, wherein the charge pump sinks and sources current responsive to the control signals received from the phase frequency detector;

a voltage controlled oscillator coupled to receive a voltage signal from the loop filter, the voltage controlled oscillator for producing an oscillation; and

wherein the voltage controlled oscillator further includes:

a ring oscillator for producing an oscillation;

a first biasing circuit for producing a first bias signal to the ring oscillator, which first bias signal is a steady state bias signal;

a second biasing circuit for producing a second bias signal to the ring oscillator, which second bias signal is an adjustment bias signal to the first bias signal; and

wherein the ring oscillator is coupled to receive the first and second bias signal and further wherein the ring oscillator produces the oscillation based on the first and second bias signals.

24. The PLL of claim 23 wherein the first biasing circuit of the VCO further includes a low pass filter for filtering received noise and noise generated within the first biasing circuit.

25. The PLL of claim 24 wherein the low pass filter includes a corner frequency that is approximately one kilohertz.

26. The PLL of claim 24 wherein the first bias signal comprises a DC current.

27. The PLL of claim 24 wherein the first bias signal is a low frequency signal whose magnitude is a function of a received control voltage.

28. The PLL of claim 24 wherein the second bias signal is a high frequency bias signal whose magnitude is a function of a received control voltage.

29. The PLL claim 24 wherein the first bias signal has a magnitude that is at least twice as large as the second bias signal.

30. The PLL of claim 24 wherein the first bias signal has a magnitude that is at least five times as large as the second bias signal.

31. The PLL of claim 24 wherein the first biasing circuit further includes a low frequency transconductance gm stage coupled in series with a high gain current mirror, the gm stage and the high gain current mirror for producing the steady state bias signal for the ring oscillator.

32. The PLL of claim 24 wherein the high gain current mirror further includes a low pass filter coupled between gates of the current mirror for filtering noise having frequency components higher than a specified corner frequency.

33. The PLL of claim 31 wherein each mirroring device of the current mirror generates a current that is a multiple of a reference current conducted by a reference device of the current mirror.

34. The PLL of claim 33 wherein each mirroring device generates at least five times more current than the reference device.

35. A voltage controlled oscillator (VCO), comprising:

means for generating a low frequency bias signal for a ring oscillator wherein the ring oscillator produces a specified oscillation responsive to a steady state bias signal wherein the low frequency bias signal compensates for process and temperature variations; and

means for generating an adjustment bias signal for the ring oscillator, wherein the steady state and adjustment bias signals are superimposed to set the local oscillation.

36. The VCO of claim 35 further including filtration means for filtering noise produced within and received by the means for generating the steady state bias signal.

37. The VCO of claim 35 wherein each of the means further includes a transconductance stage coupled to receive a control voltage.

38. The VCO of claim 37 wherein each of the means further includes at least one current mirror coupled to the transconductance stage wherein output signals produced by each current mirror are added to create the superimposed steady state and adjustment bias signals.